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Two New Cave Millipedes of the Genus *Prionomatis*
from Kumamoto Prefecture in Southwest Japan*

With 2 Text-figures

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ABSTRACT In the present paper two new species of the genus *Prionomatis* are described from limestone caves in Kumamoto Prefecture: *Prionomatis iriei* n. sp. and *P. uenoi* n. sp. Seven species of the genus have hitherto been known from Kyushu. The new species differ from all of these in the shape of the body segments and the male gonopods.

The first biological survey of the caves in Kumamoto Prefecture was attempted by the late Mr. Jujiro Ishikawa about twenty years ago. He visited four limestone caves in the summer of 1954, and obtained four different species of cave-dwelling myriapods (cf. Ishikawa, 1958). Some other species of myriapods, including troglobiotic forms, have been collected since that time (Uéno, pers. comm.), but nothing has been recorded on those collections.

Recently, Messrs. Teruo Irie and Shûsei Arai recommenced cave surveys in the same area and accumulated new materials of cave-dwelling millipedes from more than three dozens of caves and potholes. Many of these were also visited by Dr. Shun-Ichi Uéno, whose collectings are always careful and thorough. They kindly submitted their collections to the present author for study. Several troglobiotic species of *Prionomatis*, all apparently new to science, were contained in these lots. Two of them will be described in the present paper under the names of *P. iriei* and *P. uenoi*.

The holotypes and a part of the paratypes of the new millipedes described in this paper are deposited in the National Science Museum, Tokyo. Other specimens remain in the author's collection.

Prionomatis iriei n. sp.

[Japanese name: Irie Nokogiriyasude]

(Fig. 1)

Diagnosis. A small troglobiotic polydesmid millipede not sufficiently comparable to any of the described forms of the genus, though resembling *P. karyudense*

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Miyosi (1956, pp. 10, 12, fig. 1) in certain respects. Distinguished from all the other known members of the genus by the presence of clubbed bristles on tergites and by the shape of gonopods.

Male holotype. Color in alcohol pale grayish white; in life white. Length approximately 12 mm, greatest width 1.4 mm. Body slender, parallel-sided between 5th and 17th segments, gradually narrowing towards both ends. The shape of head and of some selected segments as shown in Fig. 1 A-E; the widths of them as follows:

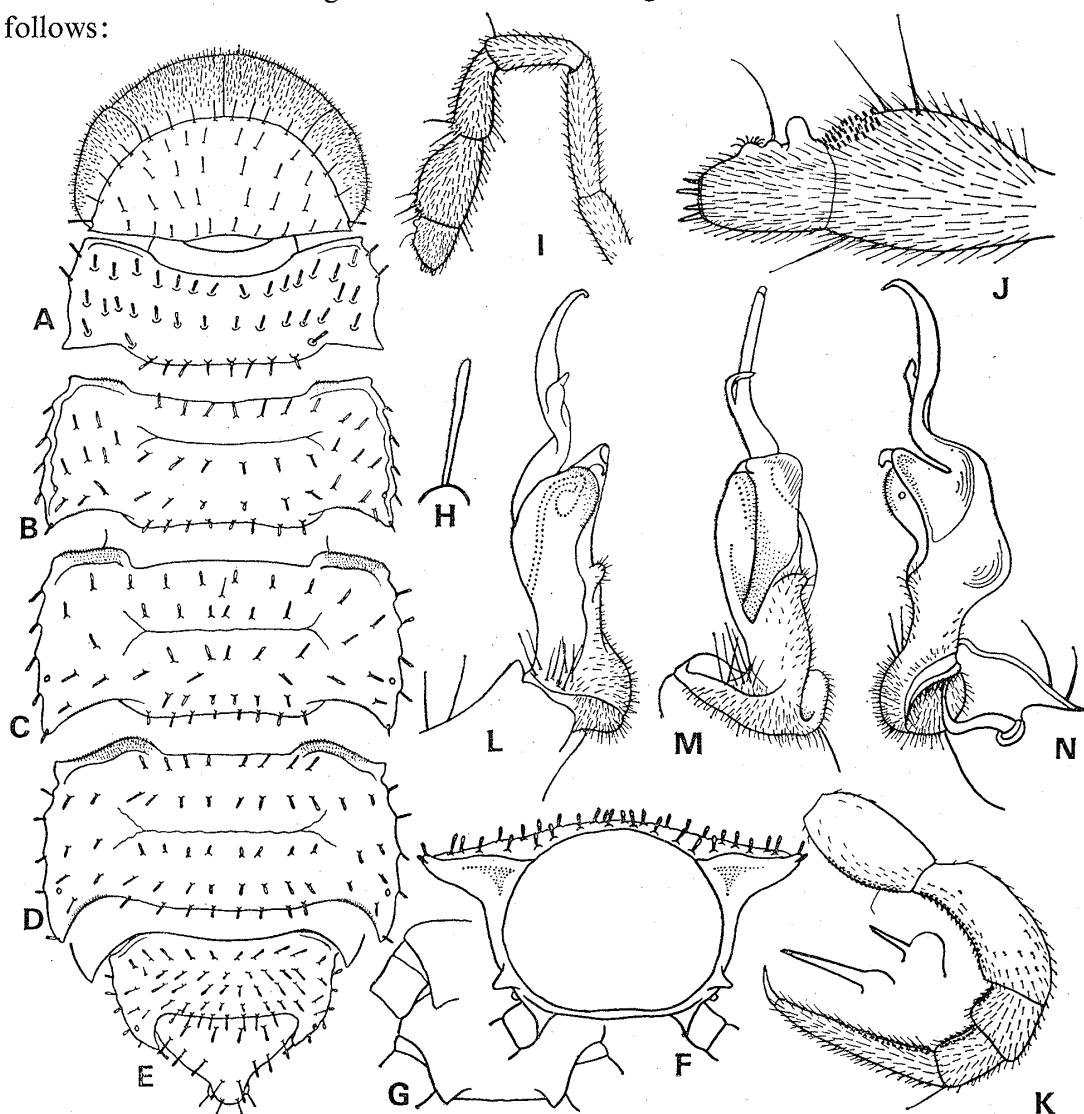


Fig. 1. *Prionomatis iriei* n. sp., holotype. — A, Head and first two body segments, dorsal aspect. B, Fifth segment, dorsal aspect. C, Tenth segment, dorsal aspect. D, Seventeenth segment, dorsal aspect. E, Caudal end of body, dorsal aspect. F, Seventh segment, excepting gonopods, caudal aspect. G, Ventral aspect of eighteenth segment (right half), showing the posterior corners. H, One of the typical bristles on the dorsum. I, Left antenna. J, Terminal articles of antenna. K, Posterior leg on eighth segment. L-M, Right gonopod, lateral, ventral and mesial aspects.

Head = 1.2 mm	Collum = 1.0 mm	Seg. 2 = 1.3 mm
Seg. 3 = 1.3 mm	Seg. 4 = 1.3 mm	Seg. 5 = 1.4 mm
Seg. 17 = 1.4 mm	Seg. 18 = 1.2 mm	Seg. 19 = 0.8 mm.

Head large, subglobular and densely covered with short and minute hairs except at the back of vertex. Antennae long and slender, reaching back to the anterior border of segment 3; articles 2-4 cylindrical; articles 5-6 subclavate; article 7 subconical, with four terminal cones; the sensory groups on the upper side of articles 5, 6 and 7 well developed as shown in Fig 1 I-J; the ratio in length and width (in parentheses) of articles 3-7 is 23(6) : 15(6) : 15(7) : 15(9) : 8(6.5). Collum narrower than head, semicircular in outline; posterior corners sharp; upper side slightly convex, with a row of 15 erect bristles along anterior margin, and with four rows of erect clubbed bristles on the surface. Succeeding segments basically similar in form to one another except for anal segment; dorsum moderately arched and with transverse median streak on each segment; the anterior half of metazonite with one or two transverse rows of subclubbed bristles, the posterior half with three rows of similar ones; bristles in the last row projecting beyond the posterior margin of each segment. Distribution of these bristles on selected segments is as shown in Fig. 1 A-E and F. Lateral keels well developed, nearly horizontal and longer than wide; upper side moderately convex, with scattering similar bristles on the surface. Scapular area of typical keels thickly bordered by marginal depression, moderately projecting forward, and provided with microscopic strigils on segments 5 through 19. Posterior corners acutely angulate on segments 2-4, more and more produced from 5, and with several rows of microscopic tubercles on inner margin. Outer margin slightly convex, with 2-6 notches; the arrangement of lateral notches and dorsal bristles as follow:

	Notches on lateral keels	Rows of bristles on tergites
Collum	0	5
Seg. 2	3	3
Segs. 3-4	3	4
Segs. 5-6	4-5	4-5
Segs. 7-19	5 (rarely 4 or 6)	5 (rarely 6)

Pores present on segments 5, 7, 9, 10, 12, 13, 15-19, small, open on the upper surface near the last notch of the pore-bearing keels. Legs moderately long and slender; prefemur thickened; femur slightly curved ventrad, and somewhat swollen dorsally; postfemur, tibia and tarsus normal in form; podomeres of prefemur through tarsus with small spherical bristles on the ventral surface. Sternites subquadrate, moderately pubescent and with deep transverse furrow; posterior corner slightly projecting caudad on posterior body segments.

Gonopodal aperture rather large and broad, its posterior margin moderately concave. Gonopods almost fully exposed and of normal size; telopodites slender, *in situ*, extending cephalad and lying parallel to median body axis. Coxa moderately large, subcylindrical, with two distal macro-setae. Prefemoral portion not so large, ovoid, and beset with long fine setae as usual. Femoral portion well developed,

distally broad; clivus roundly protuberant, and covered with microscopic processes on the margin; disto-internal portion of femur laminated and protuberant, and with a small hooked process; outer horn absent. Tibiotarsal portion very long and slender, slightly incurved, and with a small branch.

Female paratype. Length about 12 mm, width about 1.5 mm. Other somatic characters are as in the male.

Type-series. 2 ♂♂ (including the holotype), 6 ♀♀, Fūshin-dō Cave, at Gokasé of Mizukoshi, Takimizu, Mifuné-machi, in Kumamoto Prefecture, 22 December 1966, coll. by T. Irie.

Other records. 1 ♀, Fusé-dō Cave, at Fusé of Yabé-chō, in Kumamoto Prefecture, 27 August 1969, coll. by T. Irie; 1 ♀, 1 male larva, Daiichi-tsubaki-dō Cave, at Tsubaki of Toshiné in Chū-ō-son, Kumamoto Prefecture, 19 June 1966, coll. by T. Irie; 1 ♂, the same cave, 11 December 1966, coll. by T. Irie; 1 female larva, the same cave, 15 April 1969, coll. by S. Uéno.

Notes. This is a characteristic species, easily recognized from the other known species in bearing clubbed bristles on the tergites. As mentioned before, this new species have been known from three caves, which are geographically close to one another. However, they are not the same in nature. The two caves, Fūshin-dō and Daiichi-tsubaki-dō, develop in limestone strata, while Fusé-dō lies in a formation of welded tuff. On the other hand, the last-named is nearer to Fūshin-dō Cave (about 7 km distant to north-northeast) than Daiichi-tsubaki-dō is (about 11 km distant to southwest) (cf. Uéno, 1959, 1970). It is interesting that the same troglobiotic species occurs in limestone caves as well as in a tuff cave, even though all of them are located within a small area.

Prionomatis uenoi n. sp.

[Japanese name: Uéno Nokogiriyasude]

(Fig. 2)

Diagnosis. A medium-sized, depigmented, cavernicolous millipede not sufficiently comparable to any of the known members of the genus; distinguished from these by the shape of tergite and gonopods, especially by the degeneration of marginal notches on lateral keels, and by the quadripartite apex of gonopodal tibiotarsus.

Male holotype. Color in alcohol pale greyish white; in life white. Length approximately 22 mm, greatest width 2.0 mm. Body slender, parallel-sided between segments 7 and 15, and gradually narrowing toward both ends. Tergites polished; outer margins of lateral keels without serration as usual for a member of the genus. The shape of head and of some selected segments as shown in Fig. 2 A-D; the widths of them as follows:

Head = 1.8 mm	Collum = 1.6 mm	Seg. 2 = 1.6 mm
Seg. 3 = 1.6 mm	Seg. 4 = 1.6 mm	Seg. 7 = 2.0 mm
Seg. 15 = 2.0 mm	Seg. 16 = 1.9 mm	Seg. 18 = 1.6 mm.

Head and mandibular cheeks large, subglobular, beset with short fine hairs except at the back of vertex. Antennae long and slender, about 3.7 mm in length, nearly reaching back to the anterior border of segment 4; the ratio in length and width (in

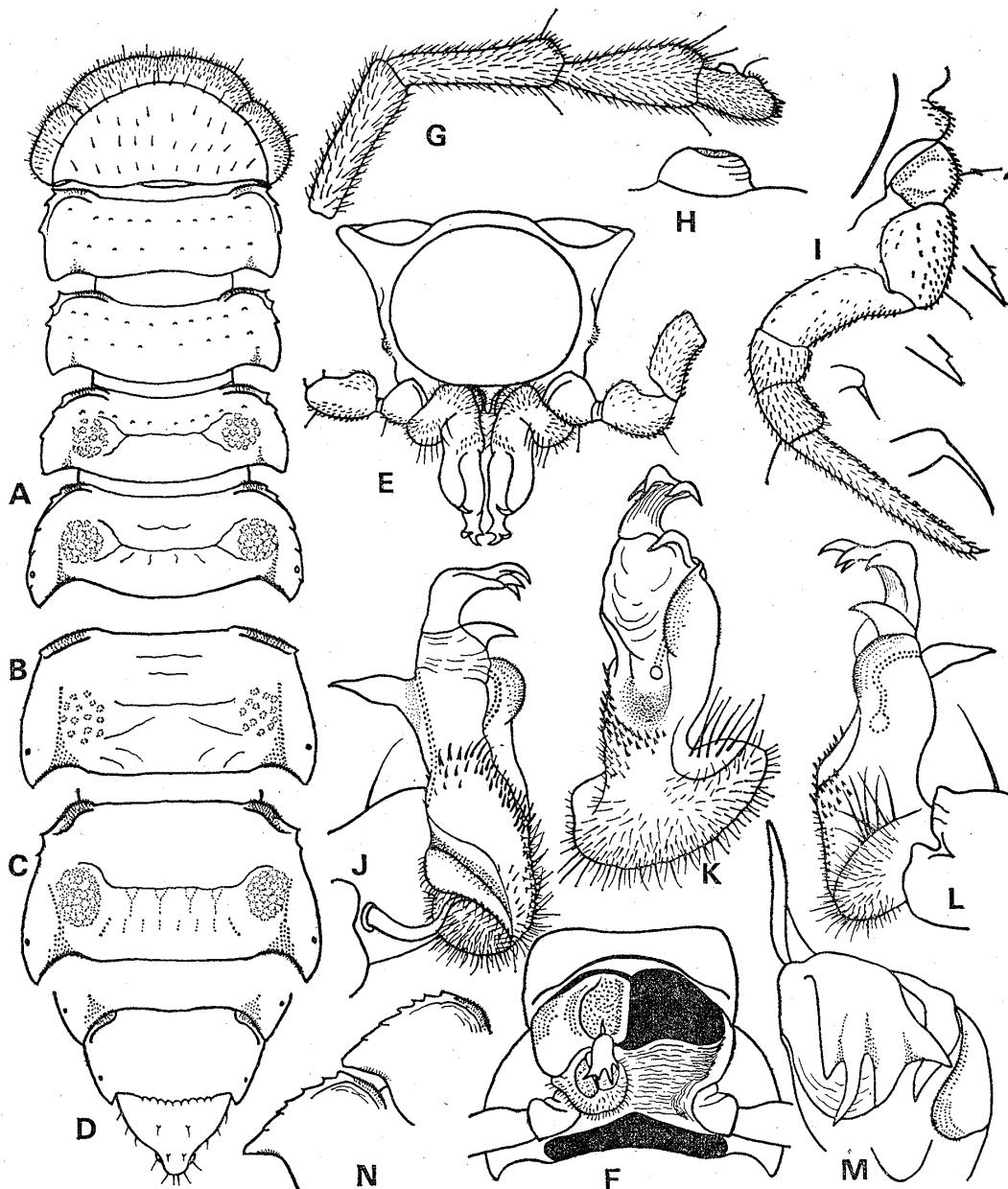


Fig. 2. *Prionomatis uenoi* n. sp., of Gongen-yama-dō Cave. (A–M, holotype; N, a larval specimen) — A, Head and first five body segments, dorsal aspect. B, Seventh segment, dorsal aspect. C, Tenth segment, dorsal aspect. D, Caudal end of body, dorsal aspect. E, Seventh segment, caudal aspect. F, Ventral aspect, the same, *in situ*, showing gonopodal aperture. G, Last four articles of antenna. H, Sensory prominence on seventh article of antenna. I, Left leg of eighth segment. J–M, Left gonopod, mesial, ventral, lateral and frontal aspects. N, Left lateral keels of fourteenth and fifteenth segments, in a larval specimen with 18 body segments.

(parentheses) of articles 4–7 is 16 (6) : 21 (6.5) : 17 (8) : 9 (6); sensory hairs on articles 5 and 6 usually developed, and sensory prominence on article 7 rather large and truncated. Collum narrower than head, convex, almost semicircular, with the posterior margin slightly concave at the middle in dorsal aspect; each posterior corner feebly produced, without lateral notch; a row of 14 fine bristles present along the anterior margin and three rows of 8–10 fine bristles on the surface. Segments 2–4 similar in general appearance; dorsum with one or two rows of microscopic tubercles on the anterior half of each metazonite; outer margins of lateral keels with three small and sharp notches; posterior corners slightly produced. Succeeding segments basically similar in structure to one another. Dorsum slightly convex, nearly glabrous, polished, and with a median conspicuous streak, and with weak wrinkles on the posterior half of metazonite. Lateral keels well developed, nearly horizontal, its upperside moderately convex. Posterior corners produced, with several rows of microscopic tubercles on the inner margins. Scapular areas rather thickly bordered by marginal depression, and provided with microscopic strigils on the surface. Outer margin slightly convex with 5 small notches on anterior segments, only one or two notches present on mid-body segments, and they are nearly obsolete on posterior segments. Teeth of segment 19 very small. Sternites subquadrate, pubescent, with a crossing furrow; posterior corners slightly produced on segments 8–18. Pores small, opening on the upper surface at the lateral margin near caudal edge of pore-bearing keels. Legs long, slender and normal in shape, with spherical bristles on the ventral surface of postfemur through tarsus; claw rather short and acute.

Gonopodal aperture large, transversely oval, extending far laterad; sternal surface between 8th pair of legs depressed and moderately rugose. Gonopods almost fully exposed, relatively short and robust for a member of the genus; telopodite, *in situ*, extending ventrad, and adjoining each other. Coxa large, subcylindrical, with two isolated macro-setae. Prefemoral portion suboval, and beset with long fine setae. Femoral portion well developed, covered with fine setae, its disto-ventral surface with thick setae; clivus roundly projecting and covered with microscopic processes on the surface; the terminal portion markedly swollen at the ventral side; outer horn remarkably large, triangular and flattened. Postfemoral process relatively large, triangular, and bent caudad. Tibiotarsus short and stout; the distal half bent caudad, and unequally quadripartite at the apex.

Female paratypes. Length 21–23 mm, greatest width about 2.1 mm. Other somatic characters as in the male holotype.

Type-series. 1 ♂ (holotype), 5 ♀♀, 1 larva, Gongen-yama-dō Cave, at Kōjirō, Himego-chō, Amakusa, Kumamoto Prefecture, 5 September 1967, coll. by T. Irie; 3 ♀♀, the same cave, 24 November 1957, coll. by S. Uéno; 1 ♂, 9 ♀♀, the same cave, 17 April 1969, coll. by S. Uéno.

Other records. 4 ♂♂, 4 ♀♀, Kitamiya-no-ana Cave, at Kōjirō, Himego-chō, Amakusa, Kumamoto Prefecture, 6 August 1970, coll. by T. Irie & S. Arai.

Notes. This is a very peculiar species, bearing no direct relationship to any of

the known species of the genus. The structure of its gonopods, rather short and stout tibiotarsus with quadripartite apex in particular, and the shape of lateral keels are greatly different from those in all the other species known up to the present. Most striking is the disappearance of marginal serration, one of the diagnostic characters of the genus. This gives the species an appearance which does not accord with the definition of the genus *Prionomatis*. However, the serration exists in a perfect condition in larval specimens of this new species, so that it must be a member of *Prionomatis* beyond all doubt.

Gongen-yama-dô Cave lies at about 2 km south of the town of Himedo in the Island of Amakusa-Kami-shima. The other known locality, Kitamiya-no-ana Cave is only 70–80 m distant to the north from the type cave. The specimens from the latter cave are slightly different from those of the former in having somewhat smaller outer horn. The difference may be individual, not geographical.

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